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PUBLIC HEALTH

AS AFFECTED BY FOOD SUPPLY OBTAINED FROM ANIMALS.

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It is generally admitted that food, air, and water are the most important elements in the maintenance of health, and under adverse conditions it must be conceded that they are frequently important factors in the production of disease.

To enter into details, and to point out how the bodily organism of man is affected, or supposed to be affected, by the animal food of which he partakes, would be an exercise far beyond the time at my disposal; so that I shall restrict my remarks to a brief consideration of a few of the more important diseases which render the flesh of cattle, sheep, and pigs, in certain stages at least, unfit for human consumption, and prejudicial to public health.

Trichina Disease in Man.

The discovery of this disease as a *post-mortem* lesion—"white, stony concretions in the muscles"—is generally ascribed to Tiedmann, in 1822, but it was not until 1835 that Paget and Owen demonstrated the parasitic nature of the malady. In its fully-developed and sexually mature state the male "Trichina spiralis" measures $\frac{1}{18}$ of an inch, and the female $\frac{1}{8}$ of an inch in length. They inhabit the intestinal canal of numerous warm-blooded animals in great numbers, and on the second day after their introduction attain their full sexual maturity. In six days the female parasite will contain perfectly developed and free embryos in the interior, numbering from ten to fifteen thousand, and these, on attaining full size, are born. Soon after birth they bore their way through the walls of the intestines, and then through the walls of the abdomen, and finally locate themselves in the interior of the muscles, and here, after fourteen days, acquire the size and organisation of the well-known Trichina spiralis (Leuckart).

"As commonly observed in the human body, our young trichinæ appear as spirally-coiled worms in the interior of small globular, oval, or lemon-shaped cysts, which latter appear as minute specks scarcely visible to the naked eye. These specks resemble little particles of lime, being more or less calcareous according to the degree of degeneration which their walls have undergone. The eggs measure on an average $\frac{1}{78}$ of an inch in length by $\frac{1}{130}$ of an inch in breadth. The capsuled trichinæ measure $\frac{1}{20}$ of an inch in length by about $\frac{1}{130}$ of an inch in breadth" (Cobbold).

In Germany, and some other Continental countries, owing to the inhabitants partaking of raw flesh as sausage-meat and other imperfectly cooked forms, the disease to which this parasite gives rise is not infrequent, and indeed, on the authority of Rapprecht, thirty-one epidemics occurred in various towns in Germany during the first six years following the discovery of the parasite.

The pig is, of all domestic animals, most frequently affected with trichinæ, and the ingestion of the flesh of this animal by man, in a *raw or imperfectly cooked* condition, is certain to give rise to Trichinosis, and the flesh of the human subject has been used by numerous experimentalists to propagate the disease to cats, dogs, rabbits, pigeons, swine, cattle, and sheep.

In this country the outbreaks of Trichinosis have been few as compared with the number on the Continent, and no doubt this is mainly due to the fact that we, as a nation, do not eat largely of raw or imperfectly cooked flesh.

Notwithstanding this, however, all acquainted with the malady subscribe to the opinion that not a few persons succumb to this affection, and the cause of death is ascribed to other diseases, more especially Enteric Fever and Rheumatism. "Virchow had not seen a case before 1859, after which he met with no less than six in one year." The disease is either on the increase or greater attention is being paid to the subject, as cases of Trichinosis are now being frequently recorded in the medical and veterinary journals. During the past year considerable anxiety has been expressed as to the prevalence of Trichina spiralis in American swine, and apparently not without good reason, for in the July number of the New York *Journal of Comparative Medicine and Surgery*, for 1883, Mr. F. S. Billings, veterinary surgeon of that city, is reported to have made an examination of the carcases of 8,773 hogs, and to have found one in every twenty-five to be infested with trichinæ. In the month of September last, in the little town of Emersleben, a trichinous pig was slaughtered, and, according to the universal custom in Saxony, nearly the whole of the flesh was eaten in a raw state as mince-meat. Of the persons partaking of the flesh, 361 were seriously ill, and fifty-seven died of Trichiniasis. According to the State enactment, this carcase, like that of all other pigs, should have passed official examination, but it did not (*Practitioner*, February, 1884).

Regarding the vitality of the parasite, Colin states that in his experiments he found trichinæ which had been encysted in the muscles of an animal for four years, as lively as if they had only been a few days old.

From experiments also recorded, it appears that this parasite has the power to resist drying, putrefaction of the flesh, maceration, lowering of temperature almost to freezing, and elevating almost to boiling.

As previously stated, the symptoms of Trichiniasis in mankind simulate Enteric Fever and Rheumatism, and as these diseases are not uncommon in this country, and as American bacon is an article of almost daily diet in many households, may it not be that some of the cases recorded as Enteric Fever and Rheumatism are really Trichiniasis?

Be this as it may, it is evident that American and German pork—and for that part of it, pork from any country—is not a safe article of diet unless it is thoroughly roasted or boiled, and even when so cooked, if it be infested with trichinæ, it is unfit for human food, or for consumption by any animal.

Cysticercus Cellulosus.

The presence of this hydatid parasite gives rise to that disease in pigs generally called "Measles," but a more inappropriate term could not be conceived, as it bears no resemblance to the disease "Measles" in the human subject, there being neither red spots nor cutaneous eruptions on the body This disease can be propagated from the human subject to the pig, or from the pig to the individual, with great facility.

The human body not infrequently, as is well known, is the habitat of tapeworms, and especially that form or class, "Tænia solium." These tapeworms in large numbers occupy the intestine, and the segments are regularly and almost daily voided in the fæces, and if pigs are allowed access to human excrement, as is well known, they will devour it ; and where pigs are allowed to roam at large, as in Ireland, and consume all kinds of garbage, they can scarcely escape playing the host to this parasite. In this way the segments of the human tapeworm may gain the bowel of the pig. Within the alimentary canal the segments burst, and the embryos are liberated from the ovum. The free embryo "proscolex" now commences to migrate, and bore its way, by the aid of its three pairs of spikelets, through the tissues, piercing the walls of the intestines, then the tissues of solid organs and muscles. It also penetrates the walls of the blood-vessels, and in this way, also, may gain remote parts through the blood stream. Having reached its destination in the muscles or other organs, it assumes the hydatid or bladder form, and there remains permanently fixed, undergoing no higher form of development unless partaken of as food by another animal, and should that animal be man, it will, in his bowels, be developed into the mature and fully-developed Tænia solium. Leuckart is of opinion that the average period of existence of a tapeworm is two years, and that it grows not less than 1,600 segments (proglottides), each containing 53,000 eggs.

The so-called "Measles" of the pig is a disease not by any means exceptional : but I do not think that it is on the increase—pigs being brought up with greater care and cleanliness—still, salted specimens for sale in provision shops are not difficult to find even in towns where meat Inspectors hold office.

In the living pig a diagnosis in a great many instances at any stage of the affection cannot with authority be pronounced, and in the early stage of the disease it is impossible. A pig may be infested with cysticerci, and yet fat, and apparently in the best of health. A careful examination of the mucous membrane of the mouth, especially along the sides and frænum of the tongue, the inside of the eyelids and anus, may disclose the presence of the little cysts or bladders ; but if not, unless Kuhne's flesh harpoon and the microscope clear the way, we cannot detect a "measly" pig during life.

The muscles most frequently infested by the cysticerci are those of the tongue, neck, shoulders, loins, and thighs ; but any and all the muscles and organs of the body may be invaded. The flesh is paler than normal, and between its fibres the cysticerci can be seen and recognised by their white colour. "Their friability, crunching under the teeth, owing to the calcareous matter they contain. When this flesh is being roasted or fried it emits a crackling sound, due to the bursting of the cysts, and it gives the same gritty sensation between the teeth as when boiled." The flesh of a "measly" pig is clearly unfit for human food, and unless boiled or cooked to destruction of the flesh, it ought not to be given to a dog.

Rinderpest, or Cattle Plague.

This disease is neither communicable from cattle to the human subject, nor from the human subject to cattle. It is undoubtedly dependent upon a specific organism or microbe, and this specific organism has no existence in this country, or if it has, it is not possessed of sufficient vitality to propagate itself. Dr. Smart, of Edinburgh, in his little work recently published, and entitled, "Germs, Dust, and Disease," in the preface "takes opportunity of claiming priority in the discovery of micro-organisms in living tissues." His delineation (of which a drawing is given) of the "Rinderpest" germ was published in 1865, the next earliest being that of the "spirillum" of Relapsing Fever by Obermeier. In 1872 Klebs discovered micrococci in the lymphatic glands, and Semmer, 1874, also discovered micrococci in the blood and lymphatic glands. Semmer has cultivated the micrococci, and he alleges that the cultures modify the disease, but further experiments are required before the specific nature of the micrococci can be considered as determined. The microbe exists in, and apparently is indigenous to, the steppes of Russia; but in this country it has no existence, and can only reach our shores by the importation of affected animals. The regulations under which cattle from foreign countries now enter these kingdoms are so stringent, that it is scarcely possible for Cattle Plague to be again introduced; and even if it were, the machinery for its extinction is such that it would undoubtedly be stamped out at once. But the question still remains to be answered: Is the flesh of an animal affected with Cattle Plague fit for human food? From the *Veterinary Review* of 1865, page 557, I transcribe the following:—"It appears that in some instances Inspectors allow those animals which are only slightly affected to be sold for human food, while those in the more advanced stages of the disease are buried as speedily as possible. A correspondent of the *Glasgow Herald*, taking notice of this, *properly remarks* that every Inspector ought to know that before any symptoms or external indication of any disease can become apparent on an animal, the blood or some internal organ is more or less charged or assailed by some aerial or other impalpable or invisible poison, possibly animalculæ or other cryptical formation, inhaled or generated, *which must cause both the flesh and milk of the animal to be poisonous.*

"And we observe that Mons. Chauveau, Professor of Anatomy in the Imperial Veterinary College, Lyons, who is at present officially employed investigating the nature of the Cattle Plague in this country, expressed when in Glasgow, his decided disapproval of making use of animals slightly affected with the disease as human food, adding that the French Government would not allow a single pound of meat to be sold for such a purpose."

The preceding is but a sample of the many strictures aimed at myself and other Inspectors who chose to act, not from sentiment, but from a sense of duty. When Cattle Plague, in 1865, appeared in Glasgow, the whole duties connected with the working of the Act, including the slaughter and disposal of the carcases of affected animals, were intrusted to me. A power involving the pecuniary interests and welfare of thousands, and the health of tens of thousands, could neither be exercised in an arbitrary or sentimental manner without doing incalculable harm and injustice to the country. A sanatorium was instantly erected, experiments of various kinds undertaken, and among others, to test the effect of feeding animals upon the flesh of cattle slaughtered or dying of the plague. Suffice to say that in not a single instance did illness follow the consumption of the flesh—dogs, pigs, and cats, living almost exclusively upon the flesh, increased in weight, and enjoyed perfect health. The flesh of cattle which had recently contracted the disease, and on that account had been slaughtered, was then partaken of by myself, assistants, and others, and with no bad effects. A limited number of the carcases of the animals slightly affected before being slaughtered were then handed to the butchers, and as neither complaints nor bad effects followed their distribution, the practice was extended and continued until Rinderpest was finally stamped out in this country. Thousands of carcases of plague-stricken cattle were consumed by the inhabitants of Glasgow and the West of Scotland. Flesh meat was within the reach of the poorest of the poor, the health of the community was good, no epidemic prevailed and the mortality was less than usual.

Now, one sentence in regard to Professor Chauveau and the French Government. Shortly after the termination of the Franco-German War and the siege of Paris, I had occasion to visit that city on a professional tour. The subject of the siege, the privations to which the inhabitants had been subjected, the fearful mortality in cattle from Rinderpest, and kindred topics, engrossed the attention, and were the subjects of universal comment. One gentleman publicly stated in my hearing that he had been reduced by starvation to the condition that he could eat with relish almost anything except a grey-faced rat. In course of conversation I also learned that the cattle affected with Rinderpest were not slaughtered, but allowed to die on the Boulevards—the universal feeling being that it was certain death to partake of their flesh. Feeling sorry and vexed that so much valuable food should have been wasted at a time when it was of such value, I informed the company how the authorities of Glasgow had dealt with Cattle Plague carcases, and their reply was that, if a similar practice had been adopted in Paris during the siege, hundreds of persons would have been alive to-day that were in their graves.

In the early stage of Rinderpest, if the animal is bled to death, and the carcase properly dressed, the flesh is not only fit for human food, but it will defy an expert, by any method of investigation, to detect the slightest trace of diseased action. The blood and all the internal organs have always been confiscated by me, and not allowed to pass into consumption.

The recent "Medical Reports," Chinese Customs' Service, 1884, fully bear out the view as to the wholesomeness of the flesh. As the Chinese have not nice ideas of feeding, probably every case was eaten.

Foot-and-mouth Disease.

This disease is also dependent on a specific organism or microbe, and this microbe is contained in the vesicles which form on various parts of the body, especially on the mucous membrane of the mouth and alimentary canal, and on the fine portions of the skin of the teats and digits.

The microbe is also contained in the salivary and other glandular secretions, and is communicable, by inoculation or ingestion, to man, but not by inhalation. In this it differs in its communicability to cattle, as the disease spreads in these principally by inhalation. Ingestion of the flesh has never, to my knowledge, produced the disease in the human subject; but it has been otherwise with the milk. I have given the milk of an affected cow, but on whose teats there were no vesicles, to young animals to drink, and have drank it myself without bad effects; and I have seen bad effects following the administration of the milk when there were vesicles on the teats, so that I incline to the opinion that the milk of a murrainous cow is innocuous unless contaminated by the microbes in the effusion contained in the eruptions somewhere on or within the teats. In disposing of the bodies of animals slaughtered while affected with this disease, my practice is to pass the carcase, and to condemn as unfit for human food the udder and feet, and the whole of the mucous tract extending from the mouth to the anus.

Dr. Vacher, Medical Officer of Health, Birkenhead, in a paper read at the annual meeting of the British Medical Association in Worcestershire, in 1882, on the Transmission of Disease by Food, and writing of Foot-and-mouth, and the transmission of the disease to the human subject by eating the flesh, says:—"I do not call to mind a case in which the appearance of the disease in a human subject has been traced to ingested meat, while many have been traced to milk. This cannot be owing to there being much scruple about using the flesh of affected animals as food, and the simple explanation seems to be, that while the flesh is usually well cooked, the milk is ingested raw. There is no reason to doubt that the specific contagion is contained in the vesicles which characterise the disease, and that this specific contagion, unless sterilised by heat or otherwise, is capable of conveying to man the disease of which it is the seed. In districts where it is the rule to pass carcases affected with this disease, it is quite usual for the meat Inspector to retain the head and feet, and any parts marked with the eruption—as the udder, and portions of the intestines. Then the whole of the skin is, of course, removed, and the surface of the carcase, to which some have thought there is a determination of the mature contagion, is the very part which, either in boiling or roasting, would be subjected to the highest temperature. Milk, on the contrary, is directly contaminated. Large vesicles form on the udder, and even on the teats, which it is scarcely possible to avoid rupturing in the process of milking, and the contents are discharged into the milk-pail. The mixture of milk and virus is imbibed raw, and within a few hours of its being drawn. If it were the custom to eat meat nearly raw, and usual to eat the head and feet of animals affected with this epizootic, doubtless there would be instances of the disease being communicated by meat as well as milk."

At the annual meeting of the East Kent District of the British Medical Association, held 8th May, 1884, the President, Dr. Robinson, read a communication on an "Outbreak of Epidemic Sore Throat following the Use of Milk from Cows suffering from Aphthous Fever;" and as it is not only the most recent, but the most convincing demonstration of the transmission of Foot-and-mouth Disease by milk supply from cows to human beings, I extract the following:—"During the early days of the month of February, in the present year, a remarkable outbreak of Sore Throat occurred in Dover, which, on account of the suddenness of the outbreak, the severity of the symptoms, and its chief prevalence amongst those occupying the best houses in the town, attracted no small amount of public attention, and naturally provoked a large amount of interest in the investigation as to the cause thereof.

"Controversy on the subject waxed warm, especially when it became known that the course of the epidemic corresponded most intimately with the track of a particular milkman, and that the milk supplied by this man was believed to be the vehicle of the specific poison occasioning the epidemic.

"On the one side were ranged those who had suffered most grievously from the tainted milk, and who, therefore, felt correspondingly indignant upon the subject; whilst on the other side were those who, in the kindness of their hearts, sympathised with the poor milkman, whose trade they feared would be ruined by the disclosure.

"Within the short period of four days 188 persons were attacked by this malady, which, in its leading features, presented a close resemblance throughout the whole series of cases. The symptoms varied, of course, in severity, both at the onset of attack and in the sequelæ that followed; but local inflammation of the throat, accompanied by enlargement of the lymphatic glands of the neck, was the prominent sign met with in the individuals attacked, *vesicular eruptions* preceding and accompanying the inflammation. During the week ending February 9th, 205 persons were attacked, all of whom obtained their milk supply from one particular dairy. The houses in which these people resided were distributed in forty-two different streets in the town, widely separated from each other.

"In nineteen of these streets (or nearly half of the whole number) every house supplied by this milkman was invaded by the epidemic, whilst, with one or two doubtful exceptions, no other cases could be heard of in the same streets—at any rate, none of sufficient gravity to require the services of medical men. Thus the striking fact was exhibited of an exact correspondence between the milk supply and the houses invaded by the epidemic.

"In the remaining twenty-three streets where this milk was delivered, out of eighty-six houses supplied, fifty-one were invaded by the disease.

"The number of persons attacked in each house stricken averaged 2·5 per house.

"In thirty-one houses there was only one case in each, in twenty-one houses two cases in each, in fifteen houses three cases in each, in seven houses four cases in each, in five houses five cases in each, in three houses six cases in each, in one house seven cases, and in another nine.

"In addition to various degrees of susceptibility possessed by different individuals, there were other circumstances which would account for the escape of some of the dairyman's customers while others suffered. In the first place, he delivered special milk obtained from healthy cows, separately from that milk which had been blended with the infected milk; thus at one house an officer and his family had a special supply of milk in a sealed can, obtained from the dairyman's own cows, which were perfectly healthy, whilst the servants had their milk from the mixed milk: the servants suffered, the family escaped!

"There was also a separate supply of what was called 'nursery milk,' for which a higher price was charged, and this also was unblended milk. At houses thus supplied the inmates escaped, unless cream (*all* of which the dairyman obtained from the implicated source) was also purchased and taken, as it often was, with fruit at luncheon or dinner, or in tea.

"A marked feature in the epidemic was the manner in which the servants suffered, and this was accounted for by their admission that they had not only, in many instances, partaken of the infected cream, but were large consumers of the milk also.

"From the almost simultaneous character of the outbreak, especially during the first three days, it was clear that some common cause was at work in the production of a crop of cases so closely resembling each other; and when it was found that the houses in particular streets, distributed over different parts of the town, which were supplied with milk from a particular dairy, were the houses selected by the epidemic visitor, it became apparent that the milk, as in many previous epidemics, was acting as a vehicle of disease.

"My own experience, which extends back to 1872, in connection with the propagation of disease by milk has chiefly been where outbreaks of Enteric Fever and Scarlet Fever have been diffused through contamination of the milk with the specific poisons of these diseases. I have, however, notes of cases when disease in the human subject has been developed after the drinking of milk from diseased cows, but never to the same extent as in the present epidemic.

"For the purpose of ascertaining what particular taint was present in the milk, which was calculated to occasion this particular epidemic, a searching inquiry was made, and the following facts collected. The implicated dairyman obtained his supply of milk from twelve cows kept on his own premises at Dover, and also from three farm establishments in the country. All three places were visited, and diligent search made for any evidence of disease amongst either the cows, or people living or engaged on the premises.

"At one of these establishments in the country it was found that Aphthous Fever had broken out amongst the stock on January 14th, and that milk from some of the affected cows was delivered to the Dover dairyman, and, after being mixed with other milk, distributed to his customers. Moreover, it was from this infected farm alone that the Dover dairyman obtained the supply of cream furnished to his customers.

"At the beginning of the inquiry it was stoutly denied that any of the milch cows had suffered from disease, and a certificate from a veterinary surgeon and inspector to this effect was obtained and published. Recourse was had to the police, and the truth gradually oozed out, until the facts, as above stated, were established beyond dispute; then the farmer not only admitted the fact of the disease amongst the milch cows, but confessed to the sale of their cream and milk in Dover, not only to the dairyman whose milk was specially implicated, but also to another milkman, on two separate occasions, amongst whose customers a second simultaneous outburst occurred. Thus a second experiment was performed with this tainted milk, amongst another set of individuals, with like results to the first, contributing (if such corroboration was necessary) additional evidence of the presence of poison in the milk supplied from the infected farm. Thus it was clearly established that the sufferers in this epidemic partook of milk which had been secreted by cows suffering from Foot-and-mouth Disease, an epizoötic malady typically characterised by vesicular eruptions and soreness of mouth and feet, but, like human diseases, constantly presenting all manner of variations, from the most simple, and often unrecognised attack, to the malignant form which was noticed in the summer of 1872, in some herds of Iceland cattle which were brought to Leith and Edinburgh in that year. The majority of persons who suffered during the Dover epidemic presented two prominent symptoms in common, viz., inflammatory sore throat and enlargement of the lymphatic glands; but the lesions produced varied considerably in different cases.

"The vesicular eruptions were followed either by a raw, red, œdematous appearance of the mucous membrane, or white patches, and the ulcers which supervened assumed in many instances a chronic character, with thick, puckered edges, and were a long time in healing.

"When the inflammation of the tonsils went on to suppuration, recovery was much slower than after [common Quinsy, and the enlarged cervical glands remained tender, red, and swollen long after the throat symptoms had subsided, resembling in this respect the sequelæ of Scarlet Fever. Erysipelas and purulent formations were concomitants also of the epidemic. In some instances the feet of those who suffered were swollen and painful, simulating Rheumatism; and in one case Eczema occurred between the toes of the feet, the affection being accompanied with very fœtid exhalation.

"A fatal termination resulted in the cases of two children, who had very bad throats and mouths, with the extension of the disease, in one case, to the respiratory track, their deaths being, in the opinion of the medical attendant, due to the poisonous effects of the milk. Two persons who laboured under chronic Kidney Disease were respectively attacked with sore throats and died on the same day; other people in the same houses suffering also from the epidemic Sore Throat.

"In one house, three persons were attacked on the 4th February with Sore Throat. One of these was a servant girl, who was sent home, and seen by the hospital surgeon on the 9th, at 12 a.m., and died at 4 p.m. Mr. Wood gives the following history of the case:—

"'F.S., attacked five days previously with sore throat and pains in the limbs, complained on the 8th of great pain in the epigastric region, and dyspnœa. There was a purple-red patch on the left cheek, extending to the nose. At 3 p.m. on the 9th she passed into a state of coma, and died at 4 p.m.'

"Mr. Wood says this was an obscure case, but thinks it possible that it was one of blood-poisoning. Instances of the effects of this tainted milk upon domestic animals were narrated to me, but I can verify only one from personal observation. This was a dog to which a quantity of the milk in an uncooked condition was given to drink. The symptoms which this animal portrayed were a blistered and inflamed condition of the mucous membrane of the lips and mouth, and inflammation of the skin and cellular tissue between the toes of one foot, terminating in suppuration.

"The preceding description contains, I believe, a fairly accurate account of the facts relating to this epidemic.

"In extent and severity the outbreak exceeds, in a marked degree, any previous records of the results which have followed the use of milk from cows suffering from Foot-and-mouth Disease. It is, however, quite possible that many obscure epidemics of throat disease may have been occasioned by a similar cause to the above, although the history may not have been sufficiently clear to have established the fact. Dr. Eade, of Norwich, and many others, have had a strong suspicion that this is the case, and there is no doubt that epidemics of Sore Throat have been more prevalent during and following the increase of Foot-and-mouth Disease in the country.

"The official returns show that 461,000 cases of Foot-and-mouth Disease were returned in 1883, against 37,000 in 1882. The difficulty of obtaining truthful evidence is exemplified in the history of this epidemic. If I had been content with the first statement of the farmer, that his cows had not suffered with the Foot-and-mouth Disease, or with the certificate of the veterinary surgeon to the same effect, the salient point in the history of this epidemic, viz., the existence of disease amongst the milch cows, would still have remained in obscurity. Mr. Power, in concluding a report to the Local Government Board on an outbreak of Sore Throat of a diphtheritic character, at Hendon, last year, due to infected milk, refers to the coincidence of ropy character and infectiveness in the milk, etc., and after saying that the farmer was explicit in stating that none of his cows had been suffering from disease (a statement fortified by the certificate of a veterinary surgeon), concludes his report with this very terse statement upon the evidence respecting the freedom from disease amongst the cows :—

"'Such assurance might be entirely comforting, but for a growing misgiving to the effect that ailments of animals, so trivial as to be disregarded or even unnoticed by people about them, may have larger concern with occurrence of specific disease in the human subject than has heretofore been thought likely.'

"With regard to this Dover epidemic, there appeared to be, not only a special infection in the milk, but a septic poisonous influence exerted on those who drank it.

"In considering a cause for this condition of the milk, it becomes necessary to revert to the source from which it was derived. The diseased cows and stock were kept in low, close sheds surrounding a small yard, which was full of decaying manure, rotting turnips, and the infected excreta, so that the specific poison, after elimination from the animals, would, instead of living structures, have for its pabulum decomposing and putrefactive organic matter, swarming, doubtless, with the bacteria attending these changes. That milk absorbs with great facility volatile matter is a well-known fact, and on these premises the milk and cream especially would be tainted, first, from the infected cows directly, and secondly, from an atmosphere laden with germs fed on animal and vegetable substances undergoing putrefaction ; such milk would possess a peculiarly tainted character, and would therefore be calculated to produce the specially poisonous effects noticed during the epidemic. That the specific organisms of various zymotics may undergo modification according to pabulum and environment, is only in accordance with what is observed throughout the animal and vegetable kingdom. The conviction that Scarlatina poison, after residence in sewers or cesspools, obtains the power of inflicting the various lesions seen in throat affections, particularly those approaching a diphtheritic character, has long forced itself upon the minds of many observers, from the fact that over and over again such manifestations of the disease have occurred in localities visited previously by Scarlatina, when facilities existed for the storage of this fever-poison in some sewage collection, and its subsequent liberation and diffusion therefrom. In an epidemic of Sore Throat, which broke out in the early part of this year, in a village about twenty-five miles from Dover, four recent outbreaks of Foot-and-mouth Disease had occurred, and the chief supply of milk was obtained from one of the farms where this epizoötic had occurred. The yard surrounding the cowsheds, and abutting on the dairy, was piled up with dung and filth, which must have been charged with the poison of the disease, and the milk, therefore, would be liable to absorb the virus. In one of the first houses invaded, the father of the children had been engaged in turning over the infected manure, and many of the children attacked had to pass the manure, which was spread out close to the public road. The eruptions about the lips and the alæ of the nose were very similar to that noticed in persons who had drank milk from aphthous cows ; but the appearances in the throat approached nearer the diphtheritic character. There was no evidence of recent importation of either Scarlet Fever or Diphtheria ; the only specific poison that appeared to have established a habitat in the locality was that of Foot-and-mouth Disease ; and, from the history and characteristics of the epidemic, there was reasonable ground for believing that the source of the poison was derived from cattle, the medium in this case being infected excrement. I have referred to the last-mentioned outbreak here because a record of the facts observed during its investigation may, in connection with the foregoing description of the Dover epidemic, help to elucidate some of the difficult problems involved in the etiology of throat affections."

Pleuro-Pneumonia Epizoötica.

This disease is dependent on a specific organism, and only attacks cattle. In sections of the lungs, and in blood drawn from the living animal, my colleagues and myself have invariably found numerous micrococci. They are distinctly oval, and in the blood occur single as dumb-bells, in colonies, etc. They are well shown by staining with Bismarck brown.

By inoculation or otherwise I have never yet transmitted or seen the disease transmitted to any other class of animals, and by not a few veterinarians it is believed not to be inoculable even in cattle, and certainly *it must be conceded that inoculation does not produce the characteristic lung lesions.* The blood poison or microbe selects the lung tissue for its culture and growth, and is given off in the breath exhaled by the affected creature, and if the inoculation theory be true, it is also fixed in the tissues and juices of the lung. I have fed dogs and other animals on the diseased lungs, and on the flesh, for long periods of time, and observed no bad effects, but the reverse, and I have therefore been forced to conclude that the carcase of a pleuro animal in the early stage of the disease is not unfit for human food.

A great deal has been written regarding the appearances presented by the flesh of animals which have been slaughtered during the progress of the disease, but I have failed in observing them, and granting that the lung lesions are confined to one side of the chest, and the Inspector is only allowed to examine the one half of the carcase, in the majority of cases he could with no reliable authority say whether the flesh was that of a diseased animal or not, and certainly he could not name the disease.

While I incline to the opinion that the carcase of an animal affected with Pleuro-pneumonia Epizoötica is innocuous, still it does not follow that it is nutritive, and in all stages fit for human food. If the animal is in fair condition at the date of slaughter ; if the effused products in the lung or lungs have not undergone softening, or the formation of pus, and the flesh of the carcase, after hanging twenty-four hours, presents a firm appearance, and if the cut across the muscles down to the bone is dry, and the fat pearly and firm, then I consider that carcase fit for human consumption, and such carcases have always been devoted to that purpose in the city of Glasgow, and without complaint.

From the "Centralb. fr. d. Med. Wiss.," No. 9, 1884, we learn that T. Poels and Dr. W. Nolen, in Rotterdam, have ascertained that in Pleuro-pneumonia of cattle, the pulmonary exudations contain micrococci, which, in their morphology and mode of growth in artificial cultures, are identical with the micrococci of human Pneumonia. They also assert that *artificial cultures of the micrococci, derived either from human Pneumonia or from Pleuro-pneumonia of cattle, produce in cattle the typical Pleuro-pneumonia.*

That micrococci are plentifully present in the pulmonary exudations of the human subject or of cattle, is only what might be expected, but that *artificial cultures of human micrococci, when inoculated on cattle, produce the specific contagious Pleuro-pneumonia of cattle,* is so contrary to all my experience that I will not in the meantime accept it as proven.

Anthrax, or Splenic Fever.

This disease is also dependent on a microbe, the "Bacillus anthracis." This organism was discovered in 1850 by Rayer, and about the same time by Davaine, in the blood of animals which had died of Splenic Fever; but as organisms of various kinds are to be found in the blood of animals which die from disease, no specific importance was attached to it at the time. In 1876, Dr. Koch, a German physician, succeeded in isolating and cultivating the organisms, and in our own country, and about the same time, Dr. Sanderson achieved the same success, and the publication of the experiments performed by them have made us familiar with the life-history of the microbe.

As seen in the blood and tissues, the Bacillus anthracis in its earliest stage of development appears a short protoplasmic rod, in length from one to four times the diameter of a human red blood-corpuscle. The rods vary in length; if watched, they are observed to grow, and, having attained a certain length, to divide. The rod, externally, is formed of a sheath, and its interior is filled with protoplasm. In its early stage the rod appears homogeneous, but in a short time it changes, and presents a granular mass, broken here and there. These little masses ultimately form the spores or seeds. When the seeds are fully formed, the sheath gives way, and the spores are thereby liberated. In the spores or seeds, as distinguished from the rods, the contagion in its most deadly and persistent form apparently exists, and the vitality of the organism is something almost incredible.

If, for example, the blood containing fully-developed "spores" is dried (even although it may be into the condition of a powder or dust), and thereafter wetted and allowed to dry and form again a dust, and even allowed to remain in the midst of putrefying matter, its results on inoculation are positive and deadly. Koch subjected the blood to these tests, and after four years' retention in his possession, on inoculation it was in every case as positive and destructive of life as fresh blood. Another important fact in connection with the life-history of this microbe is this, that it can be cultivated or grown artificially, and not even in connection with a living body. Koch grew it in the aqueous humour of the eye of the ox. In two hours the rods commenced to lengthen, and in four hours they had increased from ten to twenty times in length. A sound animal inoculated with the blood of an affected animal almost immediately thereafter shows symptoms of illness, and rarely lives longer than twenty-four hours. The microbes multiply with such rapidity that the capillaries become filled with them, the blood is robbed of its oxygen, and the circulation stopped.

Dr. Sanderson has also discovered that brewers' grains is a capital field for sowing and cultivating bacilli, the smallest quantity of the organisms introduced to the grains rendering the whole fit to propagate the disease by inoculation. The Bacillus anthracis can also be cultivated in an infusion of hay, and in serum and urine.

Dr. Cameron, M.P., Glasgow, in his able address to the Social Science Congress in 1881, on "Health," speaking of the experiments I have referred to, and their importance in enabling us to understand how zymotic diseases originate and spread, says :—"Dr. Koch's success was of immense scientific importance, for whereas it had before been impossible satisfactorily to observe the development and peculiarities of any of these organisms, or even to prove beyond possibility of cavil that it was they, and not the organic media in which they were found, which, when inoculated on other animals, gave rise to the disease, it now became practicable to remove them from all possible contamination, and to prove that this or that organism was really the cause of this or that malady."

The flesh of an animal affected with this disease is not only unfit for human food, but generally destructive to life in all animals. Veterinary and medical journals teem with instances recording fatal effects from partaking of the flesh. Dogs and cats, licking the blood, die from Malignant Sore Throat. The human subject, partaking of the flesh, or accidentally inoculated —as in dressing the carcase—succumbs to that form of Anthrax termed "Malignant Pustule." The skin and wool, or hairs of an affected sheep, goat, or ox, if saturated with the blood at or immediately after death, may become the vehicle of contamination and death by inhalation of the microbe years after the death of the affected animal.

In support of this opinion I quote the following from Dr. Aitken's standard work on the "Science and Practice of Medicine":—"The sorting of alpaca and mohair has long been known to be attended with considerable risk to life. Also the sorting of all wools and hairs which are dry, dusty, and more or less filthy from contamination with decomposing animal matter, particularly if 'fallen fleeces' are present, and all kinds of goats' hair, camels' hair, low-class East Indian, Persian, and such-like wools, are injurious to health, (1) from the dust and fine short hairs which arise from them, exciting chronic disease of the lungs; (2) from the amount and virulence of poison from decomposing animal matter that is liberated, producing a low form of Pneumonia (Septic Pneumonia); (3) from a specific blood-poison derived from the fleeces of animals which have died from Anthrax, producing the rapidly fatal disease now known as 'Wool-sorter's Disease.' This disease has prevailed in Bradford and its neighbourhood for more than forty years, and still continues as severe and frequent as ever it was, overclouding the life of the 'sorter' with a mysterious shadow, and threatening him daily with death. In December, 1879, a case of this disease occurred in Bradford, in which an examination of the blood showed the disease to be Anthrax; and during April and May, 1880, five more cases occurred in the same neighbourhood, four of which were rapidly fatal, *i.e.*, within three or four days a malignant pustule formed in three of these cases. The men had been sorting what is known as 'van mohair.'"

Dr. Vacher, to whom I have already referred, writes :—"There is another animal disease which may certainly be transmitted by specifically infected food, *i.e.*, Anthrax or Splenic Fever. Here, however, the fluid in which the contagium lives being the blood, all the tissues must be regarded as infective—the muscles markedly so. One does not hear of infection by milk because the secretion is commonly checked or entirely arrested, and the course of the disease is rapid and fatal. Still, there is at least one well-authenticated case of this disease being conveyed to a human being who drank the milk of an infected cow. Cases of infection by means of meat taken as food are not frequent, because Anthrax flesh readily decomposes, and has so bad an appearance that it can only rarely be introduced into the market. That this disease is transmissible to man is, unfortunately, too certain, and even those who contend that it is only thus transmissible by inoculation, will admit that food may come into contact with a wound in the mouth and be the inoculating agent."

Bovine Tuberculosis—Perlsucht.

This disease, which is characterised by the formation of little bodies termed tubercles within and on various organs and membranes of the body, has, by the recent discoveries of Koch, been traced to be due to the presence of a special microbe, "Bacillus tuberculosis." *All bodies termed tubercles* do not, however, contain this microbe, and this is a point of grave interest alike to the veterinarian and the general public. Further, a naked-eye examination cannot decide whether the parasite is present or absent, and, moreover, it requires a special staining, and a considerable acquaintance with microscopic detail to be able to detect the organism when present.

Bovine Tuberculosis, like human Tuberculosis—Phthisis Pulmonalis (the Consumption of the general public)—is hereditary and infectious. Inoculations with crushed and softened tubercle have transmitted the disease to a great variety of warm-blooded animals—in truth, it may be said that few animals can resist inoculation. The disease has also been transmitted by ingestion of the flesh and tubercles, and the drinking of the milk of affected cattle. Tappeiner (Virchow's "Archiv," vol. lxxiv., 1878) caused dogs to inhale phthisical sputum, which was sprayed into their cage for a certain time once or twice a day, and for a number of days in succession. As a result he produced Tuberculosis in eleven days.

From the *New York Journal of Comparative Medicine and Surgery*, vol. iv., page 180, I extract the following :—" Dr. E. G. Janeway relates a number of cases of Phthisis ('Archives of Medicine'), illustrating its possible contagiousness. Among others was the case of a phthisical young man who kept a pet dog. He was accustomed to sleep with the dog nestling in his arms. The animal became affected with a cough, and subsequently died. Another dog shared the same fate; a third dog suffered from a cough, but its owner died of Phthisis, and the dog subsequently recovered."

The Bacillus tuberculosis has been found in the breath of human patients with advanced Phthisis (Dr. Arthur Ransome, "Proceedings of Royal Society," London, 1882).

Until lately it was the general opinion that bovine and human Tuberculosis were entirely distinct affections, but the concensus of opinion is now, I think, in favour of their being one and the same disease. Seeing, then, that bovine Tuberculosis can be transmitted with certainty to other animals by inhalation, ingestion, and inoculation, and that "tuberculous matter derived from man will produce Pulmonary Phthisis in animals, and this inoculated Phthisis may be transmitted by inoculation to other animals," it is but reasonable to conclude that bovine Tuberculosis may be, and is sometimes, transmitted to the human subject by *eating the flesh and drinking the milk* of tuberculous cattle.

The evidence on this point is, of course, of a limited character, but still, to my mind, sufficiently satisfactory, and for further information I have much pleasure in referring the reader to a report by Hertsen, Fleming, and

Lydtin, "On the Influence of Heredity and Contagion on the Propagation of Tuberculosis, and the Prevention of Injurious Effects from Consumption of the Flesh and Milk of Tuberculous Animals," and which was discussed at the International Veterinary Congress held at Brussels in September, 1883.

That Phthisis Pulmonalis in the human subject is a hereditary disease, has for ages been the general opinion—in fact, no other opinion could for a moment be entertained, the sad history of innumerable families bearing but too certain evidence on this point. *That* heredity cannot, however, descend by direct transmission of the specific organism, "Bacillus tuberculosis," from the parent to the offspring, otherwise we are shut up to the conclusion that this specific organism, as a seed, may remain latent in the body for many years before it starts to fructify and grow. A more popular opinion is that the heredity descends from parent to child in a peculiar habit of body or organisation, and that this "pre-tubercular" condition of body, by climatic and other conditions to which it is daily subjected, in a shorter or longer period of time, is reduced to that condition that it falls an easy prey, an inviting field for the growth of this special form of living organism. But, as by inoculation of the Bacillus tuberculosis the body of the soundest animal proves a suitable breeding-place for the organism, it need excite no surprise when this disease appears in a family whose progenitors were known never to have suffered from the affection.

In cattle it is not often that we can clearly trace the propagation of Tuberculosis to heredity as usually understood, and even if we can, I do not entertain the opinion that the disease Tuberculosis is transmitted, but, at the most, the pre-tubercular habit, and I also incline to the view that even a pre-tubercular habit of body is not necessary.

Given a herd of cattle free from the pre-tubercular habit or heredity, and these fed, housed, and attended as they generally are on a well-conducted farm in the country, and Tuberculosis will be unknown; but remove the same herd into a large city, keep them tied up in warm byres, feed them on brewers' grains, etc., and Tuberculosis will, without fail, make its appearance. Bad hygienic conditions will also, in the country, lay the foundation for the propagation of Tuberculosis.

Since the last meeting of Congress (when we had the pleasure of discussing Mr. Cox's valuable paper on "Human and Bovine Tuberculosis") I have had an opportunity of witnessing and studying the ravages produced by Tuberculosis in a herd of Ayrshire cattle, which, I think, goes far to prove that hygienic conditions have more to do in the propagation of Tuberculosis than is generally believed.

The farm in question is situated in an upland district in the county of Ayr. It has been in the occupancy of the farmer for a long period of time, and on it there has always been a herd of Ayrshire milch cows, young cattle, and sheep. A number of years ago, some ironstone and shale pits were opened in the neighbourhood, and through a part of the farm and past the farm buildings the water pumped from these pits had to flow. Shortly after the workings commenced, it was observed that the milch cows and young stock had contracted a cough, and now and again there was a death. At all times *some* animals were ailing, and the stock never looked well. As time went on, the bulk of the herd became changed by death, sales, and new purchases—still the disease continued. The farmer was certain that the disease was connected with the water supply, and a filtering tank was erected; but, notwithstanding, the disease continued. An action was raised by the farmer, with the sanction of the landlord, against the shale-pit proprietors, and I was requested to inspect the cattle and advise.

I accordingly paid a visit to the farm, and a more pitiful sight I never witnessed. Several members of the herd, young and old, were at death's door, and reduced to skeletons, and, indeed, there was, to outward appearance, scarcely a sound animal present. I had two of the cattle killed—one far advanced in disease, and the other only slightly. Before killing the animals my colleague, Dr. Limont, Professor of Physiology and Morbid Anatomy, examined the blood microscopically, but we both failed in detecting a specific organism.

The *post-mortem* in both cases displayed general Tuberculosis—far advanced in the first animal, and rapidly progressing in the second.

After suitable preparation, the tubercular deposits in both animals were examined, and the bacilli of Tuberculosis were found plentifully present. On my recommendation law proceedings were stayed, compensation was granted, the herd slaughtered, and it was arranged to conduct the water in pipes underground. The farmer has put on a fresh stock, and as yet all goes well.

The flesh and the milk of an animal affected with Tuberculosis is, in my opinion, in all stages, unfit for human consumption, and, acting on my opinion, I have for more than twenty years condemned every carcase which has passed under my control.

Swine Plague—Pig Typhoid.

This disease, which annually destroys a large number of pigs in this country, and may be described as a veritable plague in America and France, is also, apparently, dependent on a specific organism.

Dr. Klein, of London, in 1878, announced that he had discovered in the diseased organs a form of bacterium in morphological respects identical with Bacillus subtilis, and that artificial cultures of these bacilli produced on inoculation the disease in pigs, mice, and rabbits.

Pasteur has also announced the discovery of a microbe, but it differs from that described by Klein, being a dumb-bell micrococcus and not a bacillus, and Pasteur alleges that Klein's bacillus has no relation to the etiology of this disease.

During the past week (28th June, 1884) we have had an alarming outbreak of Pig Typhoid in Glasgow. On a space of less than an acre upwards of four thousand pigs are congregated, and as the buildings (old wooden cowsheds) are neither properly drained nor floored, and lie against each other, the malady has spread with great rapidity. The premises are also moving with rats.

Availing ourselves of the opportunity thus afforded of adding to our knowledge of this disease, my colleagues, Professors Limont and Macqueen, and myself have been busily engaged in the microscopic preparation of the various organs, with a view to testing the accuracy, or otherwise, of Klein and Pasteur's discoveries.

Owing to the shortness of time, we have only been able as yet to make a hurried examination of a lung, and the blood. In the scrapings of this diseased lung, and in the blood, when dried and stained with aniline dyes, after the Weigert-Koch method, we have seen numerous minute *bacilli.* They vary in length, and some are smooth and uniform, while others are beaded with what are usually called "spores." They are evidently true bacilli, and they agree in all points with the description given by Klein. Their minute size, and want of specific reaction (like that of the tubercle bacillus), certainly render their recognition a little difficult at first.

Micrococci can be got from almost any diseased lung or bowel, both being exposed indirectly to the air. Accordingly they were seen in the scrapings of this lung, but there is no special reason for supposing that they are specific.

Allowing the etiology of Pig Typhoid to remain as yet a disputed point, and although I am not aware of any recorded cases of transmission of disease to the human subject by eating the flesh, still, I think that there can be only one opinion entertained as to the unfitness of the flesh of the animals as food for mankind. In the early stages of development of the disease, the symptoms are of an obscure character, and if the carcase has been dressed by a butcher, it is almost certain to pass the inspection to which it is submitted by non-professional Inspectors. When the bowels are produced, the ulcerations of the mucous membrane will greatly assist in the diagnosis, but the bowels are generally kept back, and the carcase alone produced for inspection.

Protective Measures.

Regarding the measures to be adopted for the protection of the public, I have great pleasure in endorsing and recommending those suggested by Professor Walley at our last meeting of Congress.

"The remarks I have to make on sanitary matters apply, in particular, to the supply of milk and flesh-meat to our teeming population, and, consequently, to dairies, slaughter-houses, and dead-meat markets.

"While dairies in towns and cities are compulsorily licensed and registered, no definite rules are laid down in reference to construction, flooring, drainage, ventilation, lighting, cleansing, water-supply, air-space, etc., or such rules are very irregularly applied ; and whereas in some cases corporations insist upon proper attention being paid to such matters, in others, occupiers are allowed to keep their cowsheds in any condition they please. In addition to the strict enforcement of sanitary regulations, *every cowshed* in which animals are confined for milking purposes, *should be periodically*—say every three or six months—*inspected by a veterinary surgeon*, and every cow should be examined with the object of detecting the existence of any diathetic affection such as tubercle, or any disease of the udder and uterus ; and whenever such disease is detected, power should be given to the Inspector to remove the affected animal to a sanatorium for further observation, or to an abattoir for slaughter. If, in the latter case, it were ultimately found on autopsy that no disease existed of a nature likely to render the milk harmful, compensation should be given to the owner of the cow. The adoption of such a system as this is rendered the more necessary owing to the fact that little reliance can be placed in the statements of dairymen, that the milk (often of considerable quantity) of unhealthy cows is not sold, and the difficulties lying in the way of proving its use are too great to be overcome by ordinary legislation.

"In the matter of meat supply, while certain provisions are made for the inspection of flesh markets, and for the seizure of unwholesome flesh, diseased animals may be exposed for sale without let or hindrance. Sheep in an advanced stage of Rot, Louping Ill, or Sturdy ; cattle in the last stage of Tuberculosis, Rot, and other diseases, are exposed for sale in open markets by hundreds every year, and Inspectors have no power to prohibit such sales, or to seize animals when so exposed. Is this right ? I am most certainly of opinion that *any animal exposed in an open market or sale-yard, which gives evidence of the existence in its system of important organic disease, should be seized or removed to an abattoir for slaughter ; and according to the conditions revealed on autopsy, the carcase destroyed, or passed for human food.*

"In order further to prevent the unrestricted sale of diseased animals, *all private slaughter-houses should be abolished*, as the great majority of such animals are bought by low butchers, and removed quietly to some out-of-the-way place, or to a private slaughter-house, and there slaughtered, the carcases subsequently being conveyed surreptitiously to some sausage or prepared meat manufactory for use in the preparation of polonies, etc.

"Not only should great precautions be taken in reference to the inspection of meat at abattoirs, *very stringent measures should also be enforced in reference to horse-slaughtering establishments*, as I am quite sure that many of the products of slaughtered horses are used in the preparation of human food, more especially blood and intestines, in the manufacture of black puddings. Were these materials always obtained from healthy horses, the matter would not be of so much consequence.

In reference to *the system of inspection of meat at present in use, I am of opinion that it should be placed on a more satisfactory basis, and in order to do this, definite conclusions should be arrived at by a committee of scientific men, competent to deal with the matter, as to what constitutes unwholesome and unsaleable meat.*

"The conflict of opinion on this subject so often witnessed between professional men—doctors being pitted against veterinary surgeons, and not infrequently butchers against both—is very lamentable, and for the good of the public should not be allowed to exist.

"The great questions requiring to be settled are: What conditions are to be taken as evidence of unwholesome flesh? Is mere flaccidity, discoloration, decoloration, friability, or abnormal moisture, to be held as sufficient to warrant the condemnation of a carcase when no evidence exists as to the presence of disease in any of the internal organs?

"*In all cases, where it is possible to do so, the viscera of animals slaughtered under suspicious circumstances should be retained until the Inspector has had an opportunity of examining them*, and if any doubts exist in his mind as to the nature of any disease that may be presented, and its effects upon the nutrition of the flesh, he should be empowered to consult a veterinary surgeon, whose opinion might be further supported by the Medical Officer of Health, and from the decision of such experts there should be no appeal allowed.

"*Meat Inspectors, as a rule, receive no special training for their office.* They know nothing of the influence of disease upon the nutrition of muscle; they are utterly ignorant of the use of the microscope, and may be held as being quite innocent of a knowledge of even the elements of histology. *Not only should Inspectors be properly trained for their duties, but they should be submitted to a searching examination* before they are placed in the important position of guardians of the public health."